

CLAIMS

1. A substrate processing apparatus for processing a substrate for manufacturing a semiconductor device, comprising an object to be cooled, the apparatus further comprising:
 - a mist generator that generates a mist;
 - a carrier-gas supply source that supplies a carrier gas for carrying the mist generated in the mist generator; and
 - a mist passage through which the mist carried by the carrier gas flows to cool the object.
2. The substrate processing apparatus according to claim 1, wherein the object is at least a part of a processing vessel in which a substrate received therein is processed.
3. The substrate processing apparatus according to claim 2, wherein the substrate is processed in the processing vessel with the use of a plasma.
4. The substrate processing apparatus according to claim 3, further comprising a heater that heats the object, at least when no plasma is generated.
5. The substrate processing apparatus according to claim 2, further comprising a heating furnace that receives the processing vessel, wherein the mist passage is formed as a space defined between the processing vessel and the furnace.
6. The substrate processing apparatus according to claim 1, further comprising:
 - a temperature sensor that detects a temperature of the object; and
 - a controller that controls the mist generator and the gas

supply source, based on a temperature detected by the temperature sensor.

7. The substrate processing apparatus according claim 6, wherein

the controller carries out a control operation to stop a generation of the mist by the mist generator and a supply of the carrier gas from the gas supply source, when the detected temperature of the temperature sensor is not more than a reference value.

8. The substrate processing apparatus according to claim 6, wherein

the controller carries out a control operation to stop a generation of the mist by the mist generator, while continuing a supply of the carrier gas from the gas supply source, when the detected temperature of the temperature sensor is not more than a reference value.

9. The substrate processing apparatus according to claim 6, wherein

the controller controls at least one of a flow rate of the mist and a flow rate of the carrier gas in the mist passage.

10. The substrate processing apparatus according to claim 1, further comprising a gas-liquid separator that separates the mist circulated in the mist passage from the carrier gas, and collects the separated mist as a liquid, wherein

the mist generator generates the mist from the liquid collected by the separator.